Hardwood Lookout Trail

Algonquin Hardwood Forest Ecology

Hardwood Lookout Trail

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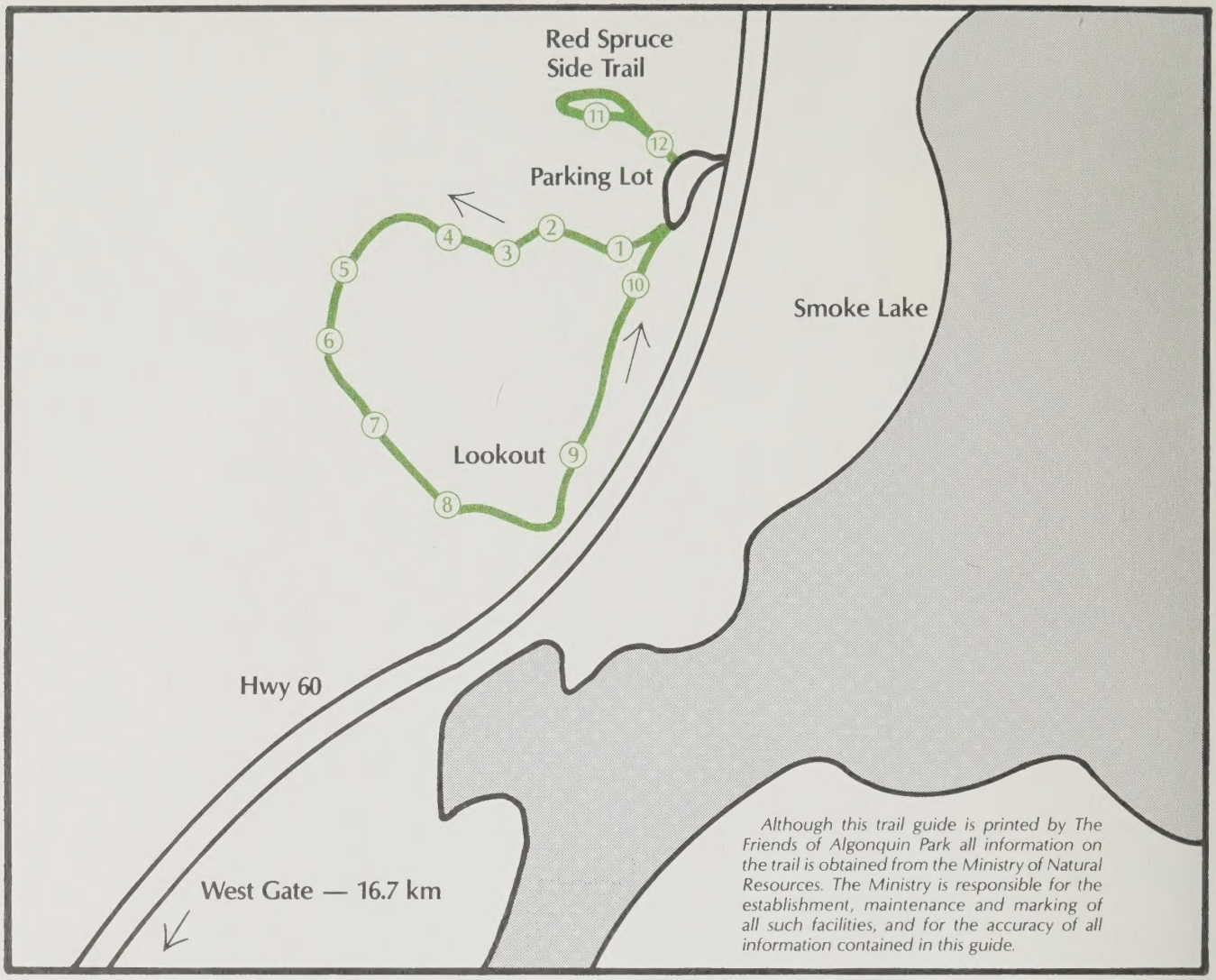
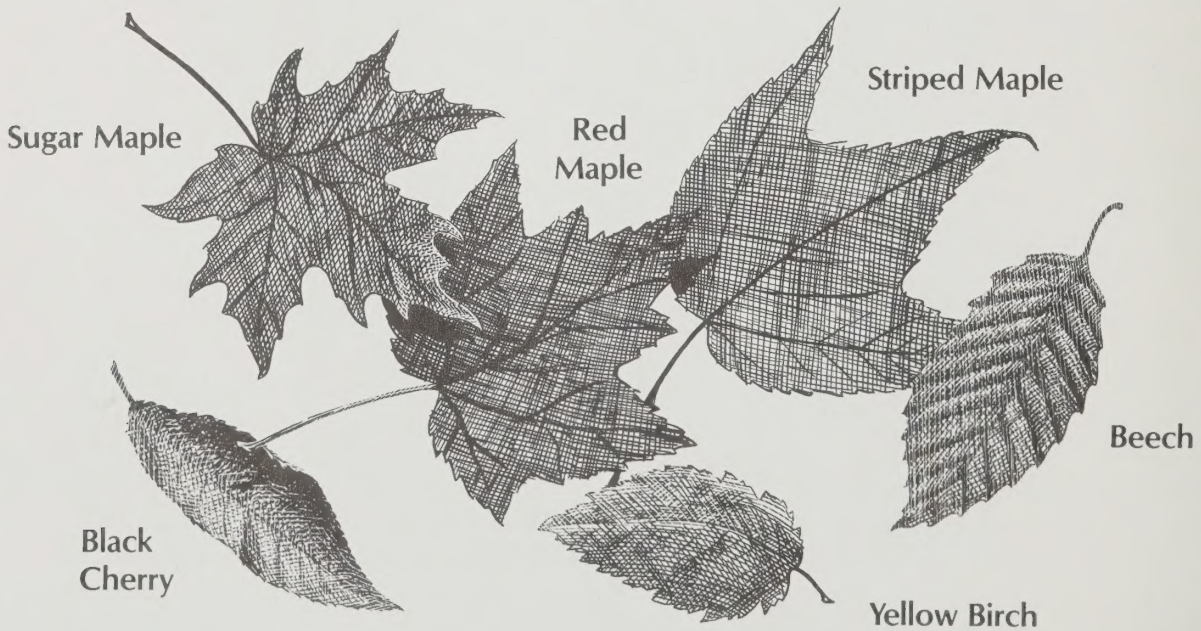


The Hardwood Lookout Trail is a 0.8 km loop which takes you through a typical Algonquin hardwood forest and culminates in a fine view of Smoke Lake and the surrounding maple hills.

The numbered sections of this guide correspond to numbered posts along the trail and offer some insight into the ecology of the hardwood forest.



Post 1 West Side Story

You have now entered a hardwood forest typical of Algonquin Park's west side. Although many people think of Algonquin as being "up north," the Park is actually dominated by distinctly southern elements — trees, plants, and animals which aren't found very much north of here. The hardwood forest is one of these southern features and is a living system very different from the more typically northern, coniferous forests which can be seen elsewhere along Highway 60.

By far the most numerous tree in the hardwood bush is the Sugar Maple, familiar to everyone as the source of maple syrup, and the leaf on our flag. The Sugar Maple is easily the most important living thing in the hardwood forest because it influences or controls the lives of every other plant and animal in the forest. This may seem a rather astonishing statement. After all, what could one tree species have to do with the life of a mouse, or a deer, or a flower? How could the Sugar Maple exert such far-reaching influence?

You don't have far to look to see the answer to this question. In summer you will see that almost all sunlight is intercepted by the canopy of maple leaves above you, creating dense shade down here on the forest floor. This shade is the single most important influence brought to bear by the Sugar Maple on other living things in the hardwood forest.

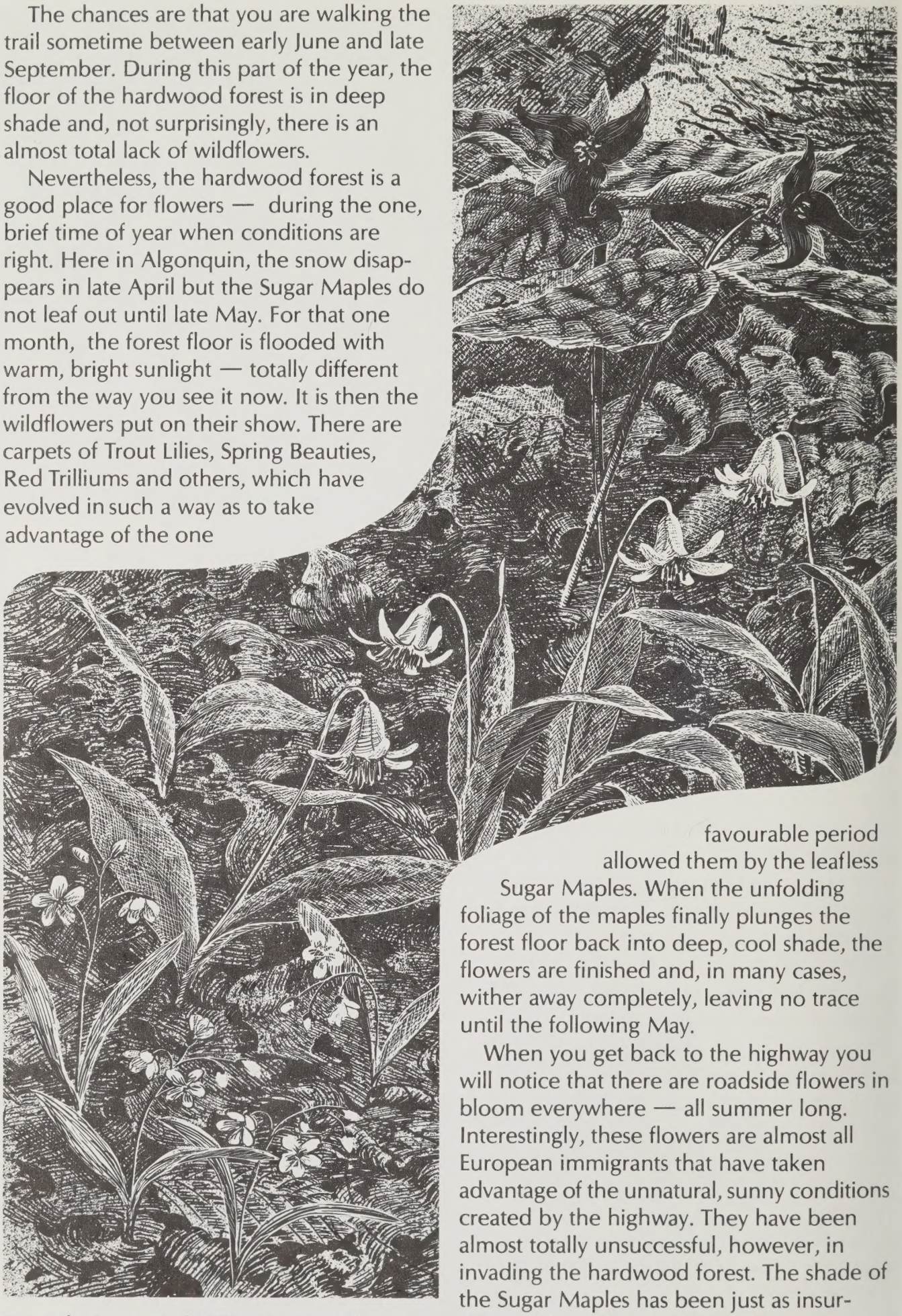
In fact, the shade cast by the maple canopy even affects the Sugar Maple itself. You will notice that the Sugar Maples around you fall into two main categories: the trees reaching high above; and a carpet of small seedlings on the forest floor. There are very few intermediate-sized individuals. The little Sugar Maple seedlings are able to grow in the shade of the big trees, but only until they are about as tall as you see them here. They may live for two or three years. But then they die — killed by the shade of their own parents. It is only when one of the big maples falls that the seedlings below have a chance to survive. The hole created in the canopy admits sunlight to the forest floor, allowing a few of the seedlings to grow upward rapidly. Eventually, one or two will become large, mature trees filling the hole in the canopy. For many years thereafter, thousands of maple seedlings will once again be consigned to a brief life and death on the shady forest floor.

That is the basic plot of Algonquin's west side story.

Post 2 Where Have all the Flowers Gone?

The chances are that you are walking the trail sometime between early June and late September. During this part of the year, the floor of the hardwood forest is in deep shade and, not surprisingly, there is an almost total lack of wildflowers.

Nevertheless, the hardwood forest is a good place for flowers — during the one, brief time of year when conditions are right. Here in Algonquin, the snow disappears in late April but the Sugar Maples do not leaf out until late May. For that one month, the forest floor is flooded with warm, bright sunlight — totally different from the way you see it now. It is then the wildflowers put on their show. There are carpets of Trout Lilies, Spring Beauties, Red Trilliums and others, which have evolved in such a way as to take advantage of the one favourable period allowed them by the leafless Sugar Maples. When the unfolding foliage of the maples finally plunges the forest floor back into deep, cool shade, the flowers are finished and, in many cases, wither away completely, leaving no trace until the following May.



When you get back to the highway you will notice that there are roadside flowers in bloom everywhere — all summer long. Interestingly, these flowers are almost all European immigrants that have taken advantage of the unnatural, sunny conditions created by the highway. They have been almost totally unsuccessful, however, in invading the hardwood forest. The shade of the Sugar Maples has been just as insurmountable to the sun-loving Europeans as it is to our native wildflowers.

Top to bottom: Red Trilliums, Trout Lilies, Spring Beauties.

Post 3 How Did They Do It?

Look up at these magnificent White Pines. In the original west side forests of Algonquin, pine like this or even bigger were scattered throughout the hardwoods, towering above the smaller maples, birch, and beech. Some of the pine were as much as 300 years old, 40 metres tall, and 1.5 metres in diameter.

In this portion of the Park, the big pines were not cut until the latter part of the last century. Even today you can often see huge, rotting stumps here and there, reminding us of the original White Pine component of the western hardwood bush and of the colourful days of the pioneer loggers.

We do not know for sure how the pine originally got established. Certainly, young White Pine cannot grow in the dark shade of a maple canopy — the conditions prevailing today. It has been suggested that the big pine were simply long-lived remnants of an earlier, more coniferous forest that was taken over by hardwoods. This idea is not supported, however, by the pollen record preserved in our lake sediments. The record indicates that the forests of Algonquin were remarkably uniform in composition for several thousand years, but changed with the coming of the white man. It may very well be that the White Pine was always a component of our hardwood forest thanks to conditions which, though quite unusual, still occurred often enough to allow the pines to perpetuate themselves. Every once in a while, for example, the canopy of Sugar Maples is literally chewed up by outbreaks of leaf-eating caterpillars like the Bruce Spanworm. When this happens much more light reaches the forest floor and young pine are given a rare opportunity to put on good growth.

We may never know for sure how these particular pine made it to where they are today but one thing is certain. They had to have help to get past the all-important obstacle of maple canopy shade.

The Park's hardwood forests originally had large, scattered White Pine.

Post 4 Getting Started in Life is Tough

Here on the damp lower slopes of this hardwood hill, you can see several scattered examples of Yellow Birch. Young specimens are easy to recognize by their yellowish, papery bark but older trees, like the one at this post, may fool you because the dark, platy bark is completely different.

The Yellow Birch is an important component of Algonquin's hardwood forests, and one which can grow from a seedling into a mature tree with only moderate amounts of sunlight coming down through the canopy above it. In other words, the shade cast by the maple canopy is not as serious for the Yellow Birch as it is for most plants.

Nevertheless, the leaves of the Sugar Maple still pose a major obstacle to the Yellow Birch — not so much when they are still on the trees but, rather, when they die in autumn and fall to the forest floor. The fallen leaves are compressed by the snows of winter into a flat, tough layer called "duff" which decays very slowly and is, of course, replenished every year. The problem with the duff layer is that it prevents the tiny seeds of Yellow Birch from getting started in life. If the seeds germinate on top of the duff they almost never succeed in forcing their tiny roots down into the mineral soil below. And, if a Yellow Birch seed is "lucky" enough to be washed down

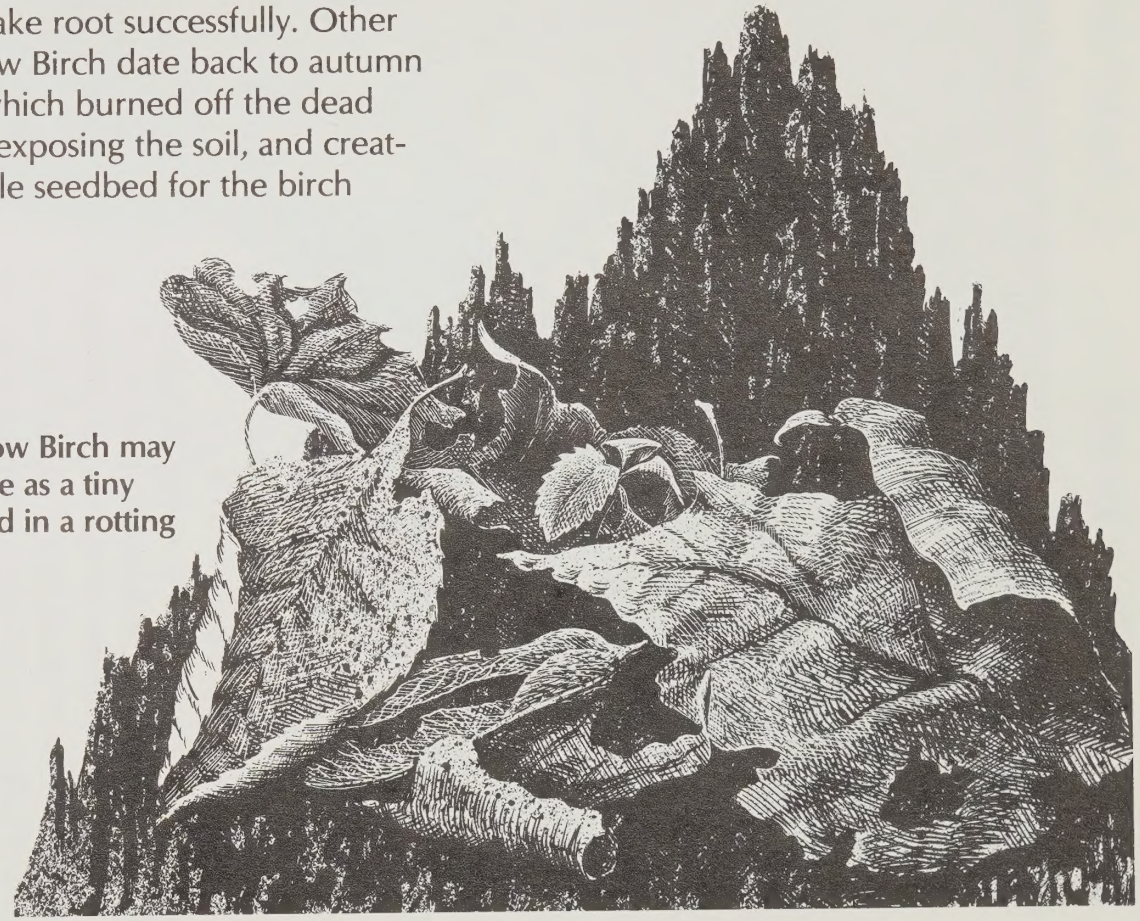
Having started life in the old stump, this Yellow Birch is now sending roots into the mineral soil below.

smothered by the duff layer above it. Once again, the Sugar Maple has a pronounced effect on the fortunes of another species living in the hardwood forest.

But, if the layer of dead maple leaves is such an effective barrier to Yellow Birch seedlings, how did the big Yellow Birch we see today get here in the first place? Well, in some cases, birch seeds happened to fall on the tops of rotting stumps or logs where there was no leaf litter and the seedlings were able to take root successfully. Other stands of Yellow Birch date back to autumn ground fires which burned off the dead maple leaves, exposing the soil, and creating a favourable seedbed for the birch

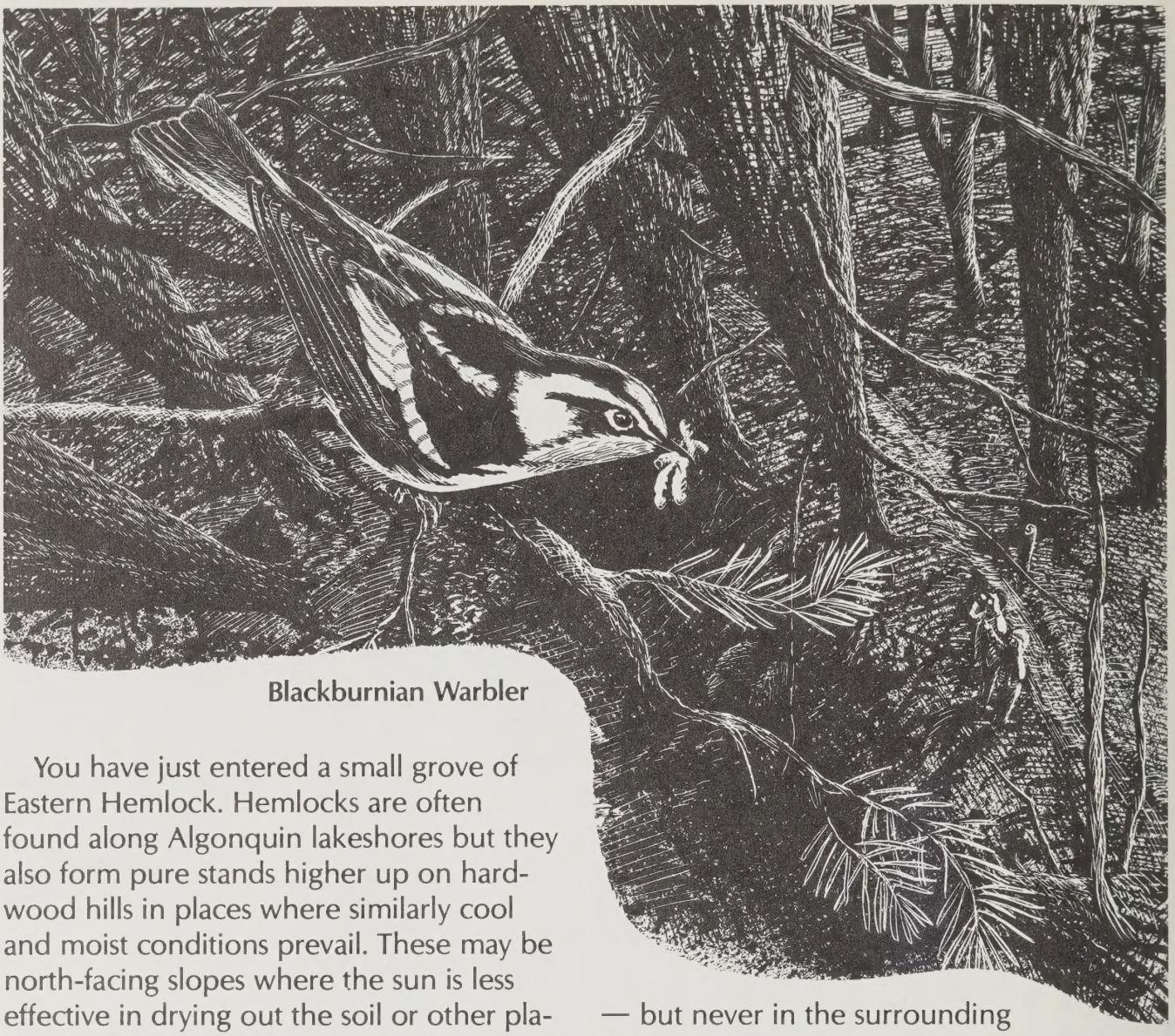
not occur every year in any one piece of hardwood forest. But they did occur often enough so that seedbeds suitable for Yellow Birch were created from time to time and trees did get established in an otherwise hostile, Sugar Maple environment.

We weren't exaggerating when we said that getting started in life was tough for a Yellow Birch — and most of the trouble is caused by all those dead maple leaves.



This great Yellow Birch may have started life as a tiny seedling rooted in a rotting stump (right).

Post 5 Hemlock Island



Blackburnian Warbler

You have just entered a small grove of Eastern Hemlock. Hemlocks are often found along Algonquin lakeshores but they also form pure stands higher up on hardwood hills in places where similarly cool and moist conditions prevail. These may be north-facing slopes where the sun is less effective in drying out the soil or other places where the underlying bedrock traps ground water and prevents it from trickling away. Given such conditions Hemlock is one tree that can beat the Sugar Maple at its own game. Sugar Maple seedlings almost never survive in the dense shade of hemlocks but hemlock seedlings can linger on under a maple canopy until light conditions improve — at which point the young hemlocks can renew growth and take over a place in the canopy.

In this way, islands of hemlock get established in Algonquin's hardwood forests. And just as with islands in the sea, these hemlock islands provide conditions so different from their surroundings that some forms of life depend on them for survival. In the summer, for example, you will find gorgeous Blackburnian and Black-throated Green Warblers making their homes in almost every hemlock grove in Algonquin — but never in the surrounding hardwoods.

Even in winter, hemlocks are important for wildlife. Because hemlock foliage is so thick, much snow is intercepted by the branches — resulting in far less snow on the ground below hemlocks than beneath the stark, leafless winter hardwoods. This difference in snow depth is of enormous importance to deer in the marginal range of Algonquin. Deer find travel very exhausting when snow reaches a depth of half a metre and here, in the western highlands of Algonquin, snow depths often reach twice that figure in late winter. Even if hemlock stands themselves contain little deer food, the cover and easy travelling they provide may make it easier for deer to reach nearby feeding areas and save them enough energy to spell the difference between death and survival. Hemlock islands are hemlock havens.

Post 6 Something for Him?

The tree on your right with the black, platy bark is a Black Cherry and the one on your left with the very smooth, pale gray bark is an American Beech.

Both of these species are capable of good growth under the climatic and soil conditions of Algonquin's west side but neither tree realizes its full potential because of the overwhelming competition from Sugar Maple. Beech, in fact, tend to be restricted to higher and drier hill tops where the maples don't do quite so well and Black Cherries are more often found in moist sites where, again, conditions for Sugar Maple are less than perfect. Even in these fringe conditions, however, and especially in places like this one where both species are growing right beside each other, most Beech or Black Cherry trees that you see in Algonquin owe their establishment more to some accident that befell the local maples rather than to their own competitive ability. Perhaps an old maple fell down, taking one or two others with it and creating a really big hole in the maple canopy. The resulting bright light conditions may then have prevailed for long enough to let suppressed Beech or Cherry seedlings take off. Perhaps there was a very poor maple seed year at the same time or an outbreak of maple-eating insects at some critical point later on that tipped the balance, temporarily at least, away from the normally victorious maple seedlings or saplings.

Whatever the exact reasons, more than just the Beech and the Cherry trees can be thankful for the lucky break(s) that led to their establishment. As we saw with hemlock at the last post, different trees often benefit different forms of wildlife. In the case of Black Cherry and Beech, our local Black Bears may be the big winners because, at times, both tree species produce large quantities of nutritious food (cherries and beechnuts) which may be critical in permitting the bears to fatten up for hibernation. They have to climb high up in the trees to get the fruit but the effort will be well worth it.

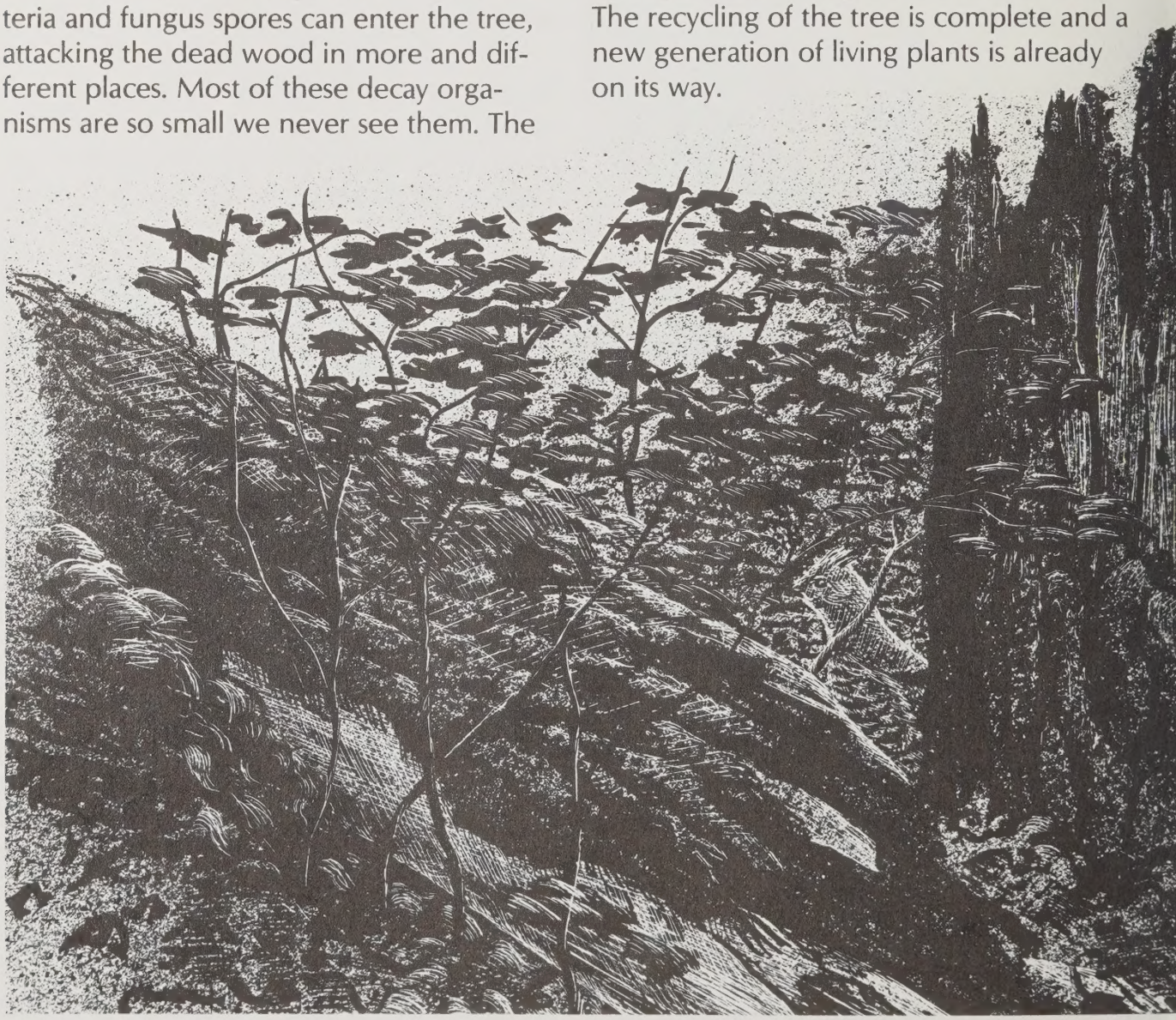
How strange to think that a bear can benefit from an unobserved accident to Sugar Maple many years earlier. How interesting to think that diversity in a forest's trees means diversity in that forest's wildlife.

Post 7 A Lot of Rot

Everyone knows that all living things — animal or plant — must eventually die. What we sometimes forget is that the dead bodies must be disposed of, broken down into their constituent parts, and returned to the soil. Strange as it may seem, decay is, in fact, one of the most vital activities occurring in the forest. This is especially true in a region like Algonquin where nutrients are scarce. Life in the forest is sustained by the continuous return to the soil of nutrients from dead plants and animals.

A great variety of living things take part in the breakdown of dead forest organisms. For example, when a tree weakens with advancing age it may be invaded by various fungi or insects which start the process of decay and hasten the death of the tree. Woodpeckers, attracted to the dead tree by the increasing insect population, make holes in the bark through which more bacteria and fungus spores can enter the tree, attacking the dead wood in more and different places. Most of these decay organisms are so small we never see them. The fungi occasionally (especially in wet years) produce the visible structures we call mushrooms. These produce millions of spores which float away through the air. If they land on suitable dead tissue they will start new fungi.

Finally, the dead tree, weakened from being slowly digested by the attacking decay organisms, falls to the ground. There, close to the moist soil, the process of decay speeds up; generation after generation of fungi, bacteria and insects live in the log, attacking, in turn, the various complex chemicals of wood. Salamanders preying on insect larvae live in the damp passages within the rotting log. And, sometimes a bear may rip open the log to get at the grubs inside. Moss covers the log, and tree seedlings take root in the soft, rotten wood. Eventually, all that remains is a long, barely distinguishable hump on the forest floor. The recycling of the tree is complete and a new generation of living plants is already on its way.



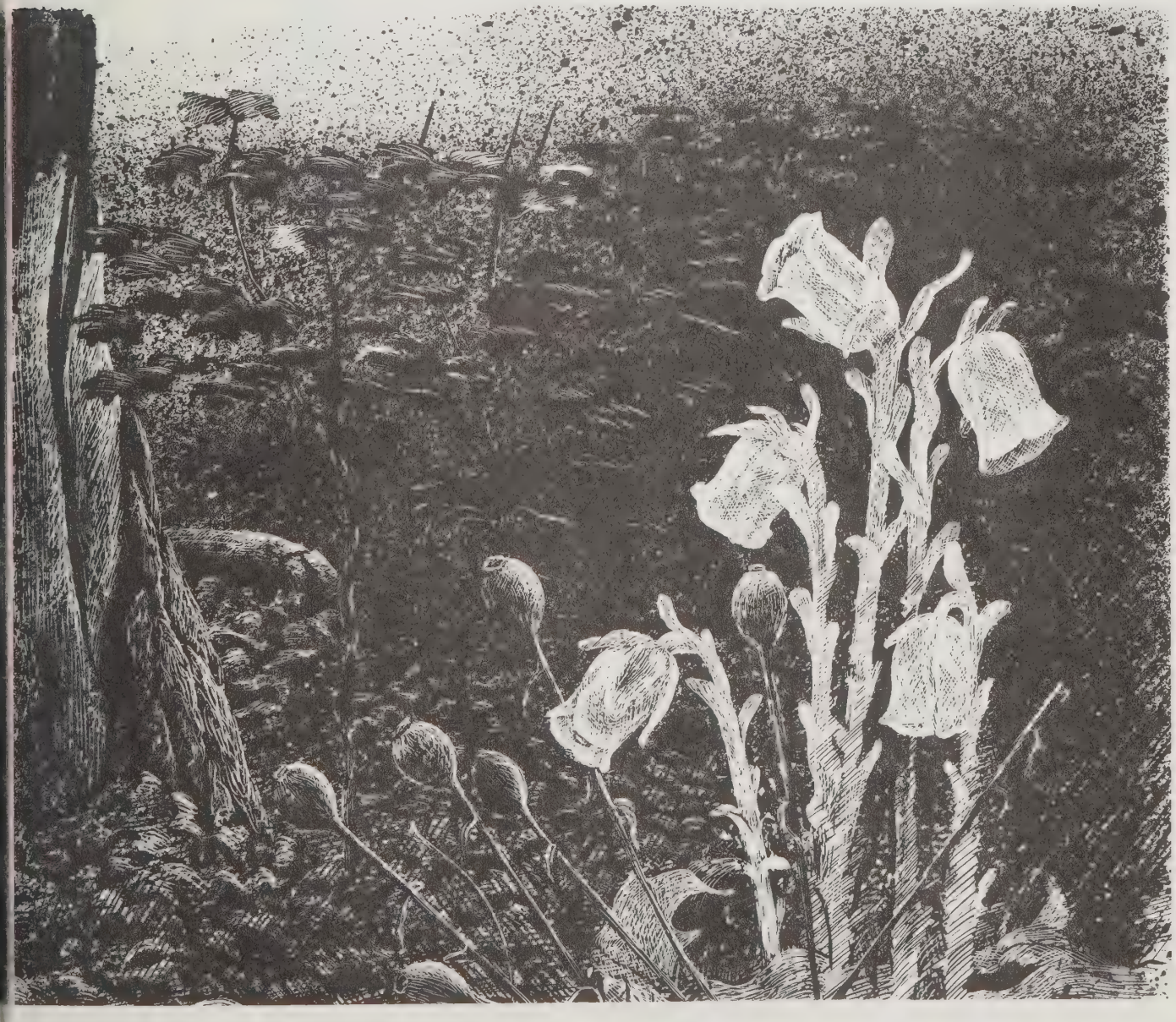
Post 8 If You Can't Beat the System . . . Adapt

Earlier on, back near the beginning of the trail, we saw how the lack of sunlight reaching the forest floor made life in the hardwood forest just about impossible for flowering plants. One solution to this major problem is for the plants to grow and flower as soon as the snow disappears and before the maple leaves cut off the energy supply.

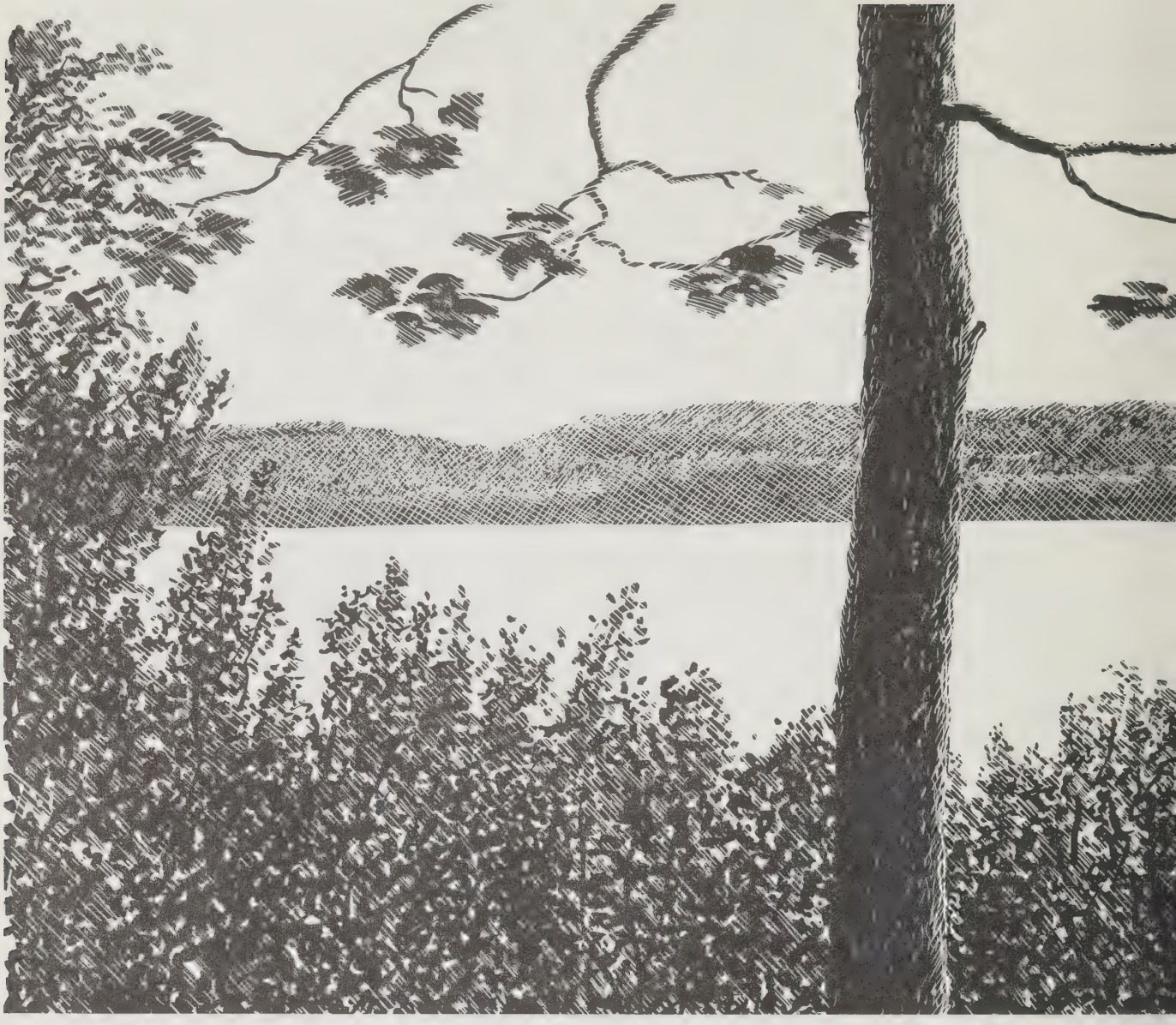
Even when the sunlight is blocked out, however, an energy supply still exists on the forest floor — in the form of complex chemicals locked up in dead leaves and wood. Mushrooms and other fungi use this energy supply, of course, but even a few flowering plants on the shady forest floor have adopted a fungus-like existence and have, as it were, "given up trying to use sunlight to make food". The commonest of these strange flowers is the ghostly, white Indian Pipe. It has completely lost the green pigment, chlorophyll, which enables most flowering plants to use the sun's energy to make their food from carbon dioxide and water. In fact, even the leaves of the Indian Pipe have all but disappeared. It rises above the forest floor to flower in late July and August, and then shrivels into a brittle, black corpse.

Actually, the Indian Pipe is a parasite. Its roots draw food from a fungus which, in turn, derives nourishment from those trees that can reach up to the life-giving sun. This is a complicated and unconventional way of life for a wildflower, but one which makes a lot of sense for a tiny plant at the mercy of the Sugar Maple canopy that lets so very little sunlight reach down to the forest floor.

Indian Pipe



Post 9 The Blazing Bucket Brigade



Looking out at Smoke Lake and its surrounding hardwood hills, you see a scene which is typical of the west side of Algonquin Park. The lakeshore is lined by a fringe of coniferous trees, but the big, rounded hills are covered, almost exclusively, by hardwood forest. These forests are the most important source, in Ontario, of Sugar Maple and Yellow Birch whose valuable wood we use in many ways.

The hardwood forests of Algonquin are also one of the Park's most spectacular attractions — in the fall when they put on an unrivalled show of gold, scarlet and orange, offset by the greens of the conifers and the blue of a thousand lakes. Right where you are standing is one of the best places to see these spectacular colours (usually reaching their peak in the last week of September).

We humans find these colour changes breathtaking but we usually assume that they are just accidental by-products of death in the leaves. In fact, they are outward signs of an important chemical salvage operation.

Leaves are green in summer because they contain chlorophyll, the amazing chemical that captures much of the sun's energy which is then used to combine water and carbon dioxide to make sugars and, from them, starch, cellulose and all the other complex substances that make up a tree. But, in addition to the chemicals they themselves have manufactured, leaves also contain minute but precious quantities of simpler substances originally obtained through the tree's roots from the soil. These substances, often called "minerals" or "nutrients", include magnesium (an essential

component of chlorophyll), nitrogen (part of all proteins) and others such as calcium, phosphorus, and potassium. Most of a tree's nutrients are contained in its leaves and it would not be very efficient to lose them all when the leaves are shed in the fall. In fact, most trees start removing nitrogen and other nutrients from their leaves almost as soon as the long, prime growing days of June and early July are over. This continues until the leaf finally loses its ability to manufacture chlorophyll, the existing chlorophyll breaks down, and yellow pigments that were there all along are exposed for the first time. By this time, half of the leaf's nutrients have been removed back into the tree (for use in manufacturing next year's leaves) but many nutrients still remain out in the leaves. It is then that maples manufacture their red pigments (called anthocyanins) from excess sugars, and there is some evidence that they protect the leaves from cold and ultraviolet light. If so, they probably serve to prolong the life of the leaves for a few extra days and permit the nutrient salvage operation to continue that much longer.

Eventually, even this eye-pleasing, last ditch effort comes to an end. Trillions of leaves then flutter down to the forest floor, and Algonquin's hardwoods will stand stark and bare through the long snowy months of winter. In spring, of course, the trees will mobilize the salvaged nutrients to grow new leaves. They will colour the park green once again and plunge the forest floor back into deep shade. The cycle will be complete — thanks in large part to the "blazing bucket brigade" that saved precious nutrients from dying leaves the previous autumn.

Post 10

We hope you have enjoyed your walk through the hardwood forest and the view from the lookout. If you do not intend to take the short side trip from the other end of the parking lot to visit the Red Spruce stand, please put this guide booklet in the box at this post so that others may use it later.

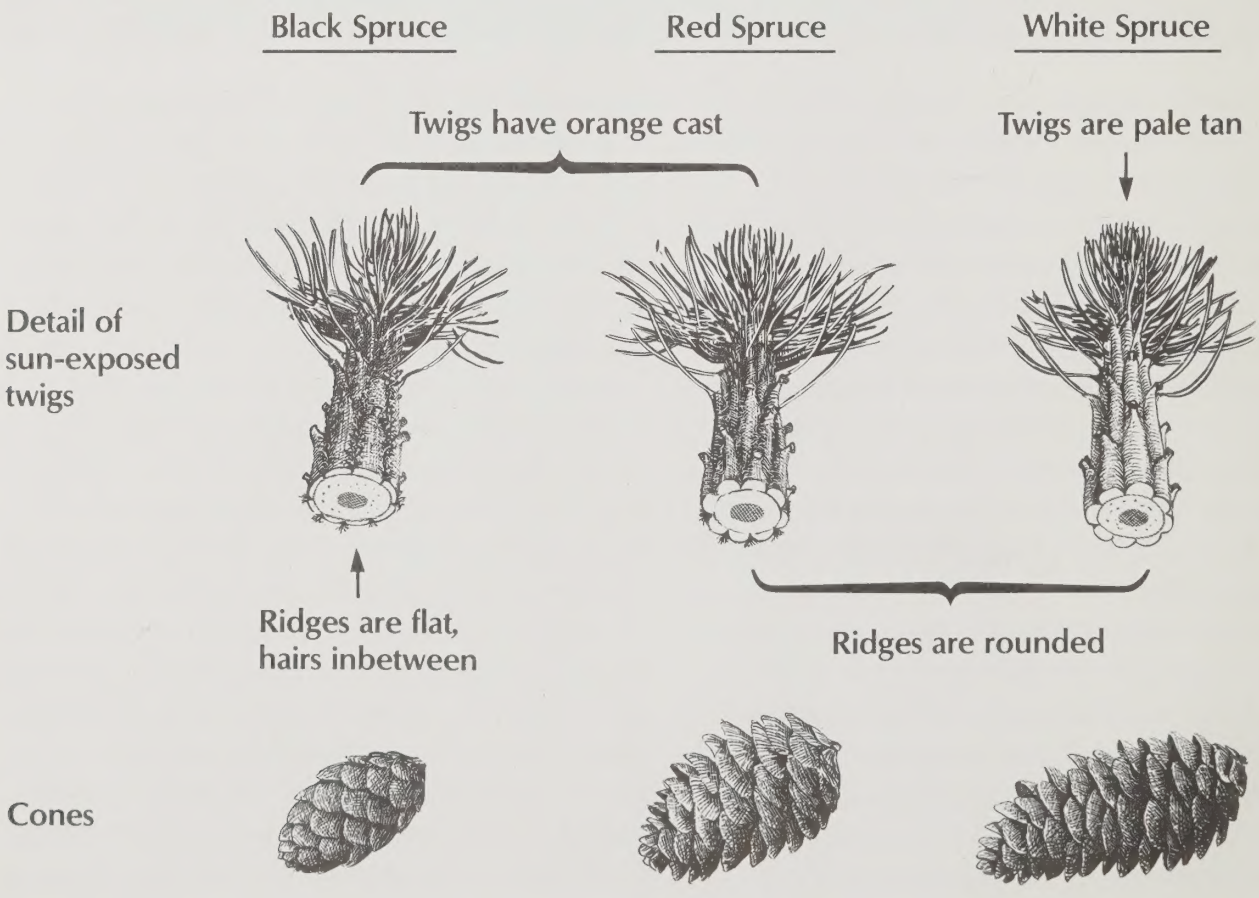
Or, if you wish to keep the guide, please pay at the entrance sign if you have not already done so. Thank you and have a good day.

Side Trip to Red Spruce Stand

From the east end of the parking lot (see map on inside front cover) a short trail leads to a small stand of Red Spruce. In Ontario this tree is restricted to isolated pockets on the west side of Algonquin Park and neighbouring Haliburton County. The side trip provides an opportunity to see for yourself a few examples of this rare tree and to learn a little about it.

Post 11 Algonquin's Mystery Tree

You are now standing before a good example of a mature Red Spruce. If you are already familiar with eastern Canada's other two species of spruce (Black Spruce and White Spruce, of which examples are identified elsewhere on this side trail), you will quickly notice some differences. The dark furrowed bark of Red Spruce has an almost purplish hue and is quite unlike the pale fine-scaled bark of a White Spruce or the dark ragged bark of a Black Spruce. And, looking upwards, you will see that the branches are robust, widely-spaced and upswept, giving the crown an aspect quite different from that of a spindly Black Spruce or of a White Spruce with its smoothly tapering crown and thicker foliage that usually hides the trunk.



Black Spruce

Red Spruce

White Spruce

The most interesting thing about Red Spruce in Algonquin is why it is found here at all, nestled in little pockets like this one or sometimes near lakeshores, but quite cut off from the species' main range in New England and the Maritimes. The probable reason for its occurrence here is that Algonquin's west side is higher than surrounding areas and therefore has a measurably cooler climate. It is also somewhat wetter because the extra height forces eastward moving air masses to lose rain or snow as they rise up over the Park highlands. Algonquin's west side climate is, in fact, remarkably similar to that encountered in many of the Red Spruce's Appalachian strongholds, and this probably explains why the tree is found in both places.

If you continue along this trail you will see other identified examples of Red Spruce (and other tree species) before returning on the same trail back to the parking lot.

Post 12

If you have now finished with the trail guide, please put it in the box at this post so that others may use it later.

Or, if you wish to keep the guide, please pay at the entrance sign if you have not already done so. Thank you.

OTHER ALGONQUIN TRAILS

This is just one of ten trails maintained in the Highway 60 region of Algonquin Provincial Park. Each is designed to introduce you to some specific aspect of the Park and each has a guide similar to this one. The nine other trails are listed below (distances are from the West Gate).

WHISKEY RAPIDS TRAIL (AT KM 7.2) This trail is a 2.1 km loop leading along the Oxtongue River to Whiskey Rapids. The trail guide discusses the ecology and history of an Algonquin river.

MIZZY LAKE TRAIL (AT KM 15.4) This 11 km trail requires an early start and a full day to do properly. It visits nine ponds and small lakes and affords some of the best chances to see wildlife in the Parkway corridor.

PECK LAKE TRAIL (AT KM 19.2) The Peck Lake Trail is 1.9 km long and goes completely around the shoreline of Peck Lake before returning you to the parking lot. The trail guide explores the ecology of a typical Algonquin lake.

TWO RIVERS TRAIL (AT KM 31.0) The Two Rivers Trail is 2.1 km long, making an easy ascent to a pine-clad cliff overlooking the north branch of the Madawaska River. The guide examines the importance of change in the natural and present day Algonquin Forests.

HEMLOCK BLUFF TRAIL (AT KM 27.2) This loop trail, 3.5 km long through mixed hardwood and coniferous forest, leads to an impressive view of Jack Lake. The trail guide discusses the importance of Algonquin Park as a living laboratory for research in a variety of different fields.

LOOKOUT TRAIL (AT KM 39.7) This 1.9 km loop is a fairly steep and rugged trail which rewards the hiker with a magnificent view of several hundred square kilometres of Algonquin. The trail guide discusses the geology of the Park.

BOOTH'S ROCK TRAIL (SOUTH FROM KM 40.3) This 5.1 km loop trail starts one km south of the Rock Lake Campground office (8 km south of Highway 60). The trail skirts two small lakes, climbs to a spectacular lookout, and returns via the ruins of an old estate and an abandoned railroad. The trail guide explores the theme of man's impact on Algonquin.

SPRUCE BOG BOARDWALK (AT KM 42.5) This unusual 1.5 km loop takes you through the best bog situation in the Highway 60 area. It is provided with several extensive boardwalk sections and gives the Algonquin visitor an excellent close-up look at the flora and fauna of two typical northern spruce bogs. The trail guide relates the history and ecology of the bogs.

BEAVER POND TRAIL (AT KM 45.2) A winding trail of 2.0 km through rugged hilly country yields close-up views of two beaver ponds, including a fine, bird's eye view from a rocky bluff. The trail guide provides an introduction to Algonquin's fascinating beaver pond ecology.

THE FRIENDS OF ALGONQUIN PARK

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